Universitat Autònoma de Barcelona

2021/2022

Genetics

Code: 102674
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OB	2	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Josep Maria Folch Albareda
Marcelo Amills Eras
Joaquín Casellas Vidal

Prerequisites

Although there are no official prerequisites, it is convenient for the student to review the basic contents of Biology and Biochemistry.

Objectives and Contextualisation

It is a subject of the second year of the Veterinary degree, of a basic nature and in which the student must acquire the theoretical and practical knowledge that will allow him to understand the organization and structure of the genome in prokaryotes and eukaryotes, the mechanisms of gene expression and its regulation at the transcriptional and post-transcriptional levels, as well as knowing the different sources of genetic variation, from point nucleotide mutations to chromosomal rearrangements, and its impact on several phenotypes of veterinary interest. The student will also become familiar with various techniques of genome analysis and genetic variability. The specific training objectives are:

- Familiarize yourself with the basic concepts of Genetics.

- Know the mechanisms that regulate gene expression

- Understand how the transmission of phenotypic characters to offspring occurs.

- Understand the processes through which genetic and environmental factors affect phenotypic variation and the various pathologies of domestic species

- Know the techniques and methods of Molecular Genetics and Structural and Functional Genomics.

Competences

- Comunicar la informació obtinguda durant l'exercici professional de manera fluïda, oralment i per escrit, amb altres col·legues, autoritats i la societat en general.
- Demonstrate knowledge and understanding of the physical, chemical and molecular bases of the main processes in the animal organism.

Learning Outcomes

1. Analyse the chromosomal basis of inheritance and the concept of ligation between genes.
2. Apply the molecular techniques used in the genome analysis (building of maps and genotyping of polymorphisms).
3. Communicate information obtained during professional exercise in a fluid manner, orally and in writing, with other colleagues, authorities and society in general.
4. Describe the processes that regulate the expression of genes in prokaryotes and eukaryotes.
5. Evaluate the effect of chromosomal mutations and rearrangement on the appearance of different pathologies in domestic species.
6. Interpret intra locus and between-gene interactions.
7. Interpret the patterns of inheritance of Mendelian and complex characters.

Content

The global content of this subject consists of five theoretical blocks:

Block 1. Organization and structure of the hereditary material.
Block 2. Gene expression.
Block 3. Inheritance and genetic variation.
Block 4. Analysis of the genome and its applications.
Block 5. Immunogenetics and herdopathology.

Likewise, the student will become familiar with the resolution of Genetics
Block A. Molecular Genetics Problems
Block B. Problems of Mendelian Genetics.
Block C. Linkage problems

Methodology

The teaching methodology that will be carried out during the whole learning process is fundamentally based on the student's work, and the teacher will be in charge of guiding him through this process. In accordance with the teaching objectives of the subject, the training activities that will be carried out are:

- Lectures: With these classes, the student acquires the basic scientific-technical knowledge of the subject that must be complemented with the study of the concepts explained.

- Self-learning-Problem solving: Students will be provided with a wide collection of solved problems where the way or ways of approaching and solving them is explained in a very detailed and didactic way. This tool will allow students to become familiar, in an autonomous but guided way, with this more practical aspect of the subject.

- Self-learning-Group work: This activity aims to promote group work, as well as enhance the ability to use computer resources to resolve issues of a biological nature. The student will be given a questionnaire with a series of questions related to the bioinformatic analysis of genetic data (data search, in silico analysis of sequences, navigation through genetic databases, etc.). Likewise, the student will be provided with information that will help him to become familiar with the bioinformatics tools he needs to solve the questionnaire. For example, if you are asked to build a restriction map of a DNA sequence, you will be instructed where to find the

online bioinformatics tool to do it and you will also be explained some general notions about its management. The work will be done in groups of 4 students

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	25	1	1, 2, 5, 4, 7, 6
Type: Autonomous			
Problem solving	17	0.68	1, 5, 7, 6
Study	24	0.96	1, 2, 5, 4, 7, 6
Work on Bioinformatic Resources	5	0.2	2, 3

Assessment

The evaluation will be individual and will be carried out continuously in the context of the different training activities that have been programmed. There will be a single theoretical-practical exam that will include two independent assessment activities. The first corresponds to the evaluation of the theory blocks by means of a test-type exam and will represent 50% of the final mark of the subject. The second evaluation activity will consist of problem solving and will correspond to 35% of the final grade of the subject. Students who have failed the theory or problem tests will be able to recover it in a recovery exam that will also include the theory part and the problem part independently. Students who have passed the exam and want to improve the grade obtained can repeat the exam, but in this case the student's presentation in the recovery exam will entail the rejection of the previously obtained qualification.

Likewise, a work will be carried out, in groups of 4 students, consisting of answering a series of questions related to the analysis of DNA sequences and the structural characterization of the genome. The realization of this work will involve the use of a wide variety of bioinformatic tools as well as consult several databases related to Structural Genomics. This work can not be recovered. In the case that a student suspends the subject, the note of the work will be kept for the next course, although you can redo it if you wish to increase the grade (this will entail the rejection of the previously obtained grade)

The grade obtained in the theory part of the exam will constitute 50% of the overall mark and the problem part of the exam will be 35%. The qualification of the work will constitute 15% of the global note. To be able to compute in this final qualification, the marks of the parts of theory and of problems will have to be equal or higher than 4, otherwise the global subject will be not passed. The maximum overall score will be 10 points. When the overall score is less than 10 points, it can be rewarded (up to a maximum of 1.5 points) depending on the student's attitude to the subject, class participation and the level of training achieved. The minimum grade to pass the course will be 5 points out of a maximum of 10 points.

The students will have the opportunity to review the grades of the exams and the work on the day / time / place indicated by the responsible teachers in the Virtual Campus.

Not evaluable: It will be considered that a student is not evaluable if he has participated in evaluation activities that represent $\leq$ 15% of the final grade.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Theoretical-practical exam: Problems (blocks A, B and C)	35%	2	0.08	1, 7
Theoretical-practical exam: Theory (theoretical blocks 1 to 5)	50%	2	0.08	1, 5, 4, 7, 6
Work	15%	0	0	2, 3

Bibliography

Text books

Most relevant bibliography:

-Brown T.A. (2017). Genomes 4. Garland Science; Edición: 4. Anglès. Versió online de accés lliure: 2nd edition https://www.ncbi.nlm.nih.gov/books/NBK21128/

-Griffiths AJF, Gelbart WM, Miller JH, et al. (1999) Modern Genetic Analysis. Freeman and Co. Anglès. Versió online de accés lliure: https://www.ncbi.nlm.nih.gov/books/NBK21248/

-Griffiths AJF, Miller JH, Suzuki DT, et al. (2000). An Introduction to Genetic Analysis. 7th edition. W. H. Freeman; Anglès. Versió online de accés lliure:

https://www.ncbi.nlm.nih.gov/books/NBK21766/?term=griffiths

-Griffiths A. J. F. (2008) Genética. Castellà. McGraw Hill-Interamericana.

-Krebs J.E., Goldstein E.S., Kilpatrick S.T. (2017). Lewin's GENES XII. Jones & Bartlett Learning; Edición: 12. Anglès.

-Krebs J.E., Goldstein E.S., Kilpatrick S.T. (2012). Lewin. Genes. Ed. Panamericana. Castellà.

-Nicholas F.W. (2009). Introduction to Veterinary Genetics. Blackwell Publishing. Anglès.

-Nickle & Barrette-Ng. Open Genetics. Book Online:

https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_(Nickle_and_Barrette-Ng)

-Nicholas F W. (1998). Introducción a la Genética Veterinaria. Acribia. Castellà.

-Pierce B. A. (2016). Genetics: A Conceptual Approach. WH Freeman; Edición: 6th ed. Anglès.

-Pierce B. A. (2015). Genética. Un enfoque conceptual 5ª ed. Panamericana. Castellà.

Species-specific:

PIPER L. & RUVINSKY A. (1997). The Genetics of Sheep. CABI Publishing.

ROTHSCHILD M. F. & RUVINSKY A. (1998). The Genetics of the Pig. CABI Publishing.

FRIES R. & RUVINSKY A. (1999). The Geneticsof Cattle. CABI Publishing.

BOWLING A. T. & RUVINSKY A. (2000). The Genetics of the Horse. CABI Publishing.

RUVINSKY A. & SAMPSON A. J. (2001). The Genetics of the Dog. CABI Publishing.

Webs:

Online Mendelian Inheritance in Animals - http://omia.angis.org.au/

Inherited Diseases Database in Dogs - http://www.vet.cam.ac.uk/idid/

Canine Inherited Disorders Database - http://www.upei.ca/~cidd/intro.htm

National Center of Biotechnology - http://www.ncbi.nlm.nih.gov

Ensembl - http://www.ensembl.org/index.html

Bovine Genome Database - http://genomes.arc.georgetown.edu/drupal/bovine/

Software

National Center for Biotechnology Information (NCBI): http://www.ncbi.nlm.nih.gov/

Webcutter: http://heimanlab.com/cut2.html

Translate: https://web.expasy.org/translate/

Nucleotide Blast (https://blast.ncbi.nlm.nih.gov/Blast.cgi)